

II. REMARKS

A. Introduction

In this Office Action claims 1, 2, 4-7 and 9-21 are noted as pending, claims 3 and 8 are withdrawn and claims 1, 2, 4-7 and 9-21 are rejected.

In summary of this Response, rejected claims 1, 2, 4, 9 and 15-21 are canceled without prejudice or disclaimer so the rejections thereof are rendered moot. Withdrawn claims 3 and 8, depending from now canceled claims 1 and 2, respectively, are also canceled without prejudice or disclaimer. The remaining pending claims 5-7 and 10-14 are amended herein, as discussed below. Further, remarks are provided.

B. Claim Amendments

Regarding support for the amendments to the claims, independent claim 5 is a combination of prior claims 1/4/5, independent claim 6 is a combination of prior claims 1/6, independent claim 10 is a combination of prior claims 2/9/10 and independent claim 11 is a combination of prior claims 2/11.

Further, the written description at, e.g., page 1, indicates that the term "flavonoids" is known to include "three major subclasses of compounds: flavonols, anthocyanins, and proanthocyanidins. Each pending claim herein has been amended by deleting the term "flavonoid" and reciting "proanthocyanidin" so as to exclude "anthocyanin".

C. Rejection of Claims Under 35 U.S.C. Section 103

The currently pending claims 5-7 and 10-14 are effectively rejected as being made obvious by a combination of Alfenito and Wagner, both already of record, for the reasons noted at pages 3-4 of the Office Action.

For the following reasons, it is respectfully submitted that the present invention, as recited by amended claims 5-7 and 10-14, were not rendered obvious by the cited combination.

Wagner indirectly discloses an amino acid sequence of Accession No. AF288189 (see, e.g., Table 1 and page 521, right column, second full paragraph), which is the same as that of TT19 protein (SEQ ID NO: 2) of the present invention, and describes that a genetic region encoding GST or an amino acid sequence similar to GST can be obtained from Arabidopsis. Therefore, Wagner only indicates the predicted annotation of the amino acid sequence of SEQ ID NO: 2 for glutathione S-transferase activity of sequestering structurally diverse-glutathione

tagged compounds (i.e. anthocyanins into plant vacuoles) (see page 516, left column, lines 22-44). However, Wagner does not describe or suggest the function of the protein having an amino acid sequence of AF288189 relating to accumulation of proanthocyanidins into plant vacuoles.

Regarding Alfenito, the Examiner considers that the state of the art as taught by this reference was to try the various glutathione S-transferases for their ability to complement the mutant for compartmentalization of anthocyanin into the vacuole. However, Alfenito only describes an activity of the various glutathione S-transferases on compartmentalization of anthocyanins into the vacuole, but does not describe or suggest any invention relating to the accumulation of proanthocyanidins into plant vacuoles.

The biosynthetic and accumulation pathway of flavonoids in a plant body is summarized in Figure 1 of the present application. Proanthocyanidins ("PA's" in the present specification, also known as condensed tannins) are produced by polymerization of flavan 3-ols (i.e., types of catechins). It was known in the art at the filing date of the present application that PAs are dominant components of testa (seed coat) of plant seeds.

In the present invention, it is found that the color of testa of tt19 mutants changed to pale-brown color, in contrast to brown in Col ecotype (see, Figure 2 of the present application). Presuming that some changes occurred to proanthocyanidins (i.e., the dominant component of testa of plant seeds), the inventors demonstrated that depositional patterns of red pigments were obviously different between Col ecotype and tt19 mutants seeds by staining proanthocyanidin precursors using vanillin treatment and that, in tt19 mutants, the efficiency of vacuolar compartmentalization of proanthocyanidin precursors decreases (see, Figure 4 of the present application).

However, Alfenito does not contain any description or suggestion relating to the function of proanthocyanidins on the color of testa. This means that there is no change in seed color An9 mutants, thus indicating that An9 does not have any functions in proanthocyanidin accumulation.

To examine that An9 exhibits a similar activity to that of TT19 of the present invention, an An9 gene is introduced into tt19 mutants to generate a genetically stable Arabidopsis transformant and to grow the transformant to examine whether the An9 gene has an ability to complement the seed color (Functional Complementation test described in Example 11; also see, Figs. 7B and D of the present application). As a result, the present inventors confirmed that the An9 gene does not have an ability to complement the phenotype of the seed color

(which is considered to be regulated by the proanthocyanidin pathway). Therefore, the function of tt19 in the proanthocyanidin pathway is novel and could not be expected from the descriptions of Wagner and/or Alfenito by those ordinarily skilled at the time the present invention was made.

III. CONCLUSION

In light of the above amendments and remarks, it is respectfully submitted that claims 5-7 and 10-14 are now in condition for allowance.

If there are any additional fees associated with this Response, please charge same to our Deposit Account No. 19-3935.

Finally, if there are any formal matters remaining after this Response, the undersigned would appreciate a telephone conference with the Examiner to attend to these matters.

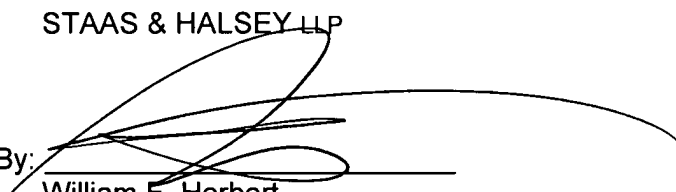
Respectfully submitted,

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